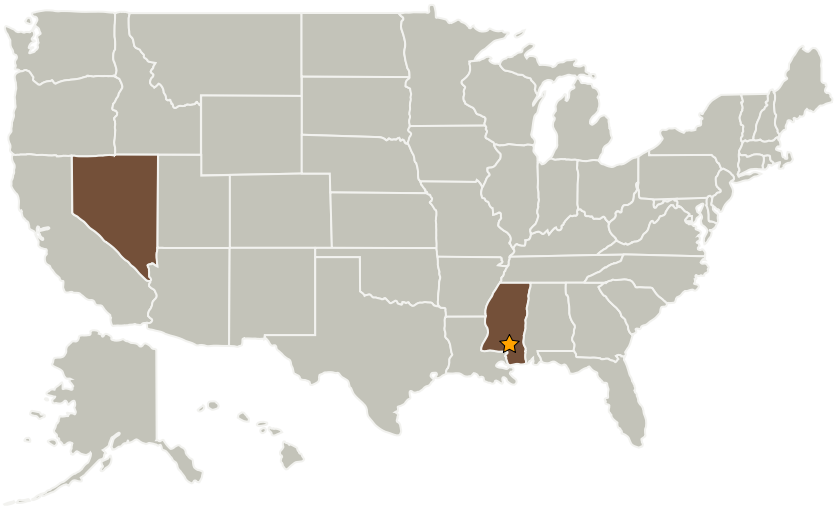
Plume Diagnostics for Combustion Stability, Phase II

Completed Technology Project (2007 - 2009)

Project Introduction

Sierra Engineering Inc. and Purdue University propose to develop a non-intrusive plume instrument capable of detecting and diagnosing combustion instability. This Stability Diagnostic System (SDS) will be designed, assembled, and tested during this effort. The SDS will include a high-speed video camera and multiple photodiode detectors for observing the plume. It will also include a software package, which will aid in analyzing the plume data and in determining the acoustic modes of the instability. To ensure that the system works properly, Sierra and Purdue will leverage an oxygen/kerosene combustor, developed under AFRL funding, to operate with unstable combustion. Technology previously developed at Purdue will be used to modify the engine's injector so that the combustion instability occurs. The dirty (soot laden) plume produced by this combustor better simulates the conditions present in full-scale hydrocarbon fueled engines. Finally, the methodology for predicting combustion response from plume observations, developed under the Phase I effort, will be matured. The SDS system and accompanying software will be delivered to NASA for future application on NASA test facilities. Successful completion of this project will provide a non-intrusive tool for detecting and diagnosing combustion instability that is superior to current, intrusive methods.

Primary U.S. Work Locations and Key Partners



Plume Diagnostics for Combustion Stability, Phase II

Table of Contents

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Stennis Space Center (SSC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Plume Diagnostics for Combustion Stability, Phase II

Completed Technology Project (2007 - 2009)

Organizations Performing Work	Role	Type	Location
★Stennis Space Center(SSC)	Lead Organization	NASA Center	Stennis Space Center, Mississippi
Sierra Engineering, Inc.	Supporting Organization	Industry	Carson City, Nevada

Primary U.S. Work Locations	
Mississippi	Nevada

Project Transitions

May 2007: Project Start

May 2009: Closed out

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX15 Flight Vehicle Systems
  - TX15.1 Aerosciences
    - TX15.1.5 Propulsion Flowpath and Interactions